Large Scale Service Deployments: Optical Control Plane
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Architectural Planes

Control Plane does not replace transport or management plane, it provides another layer between them.
Optical Control Plane Goals

- Offer real multi-vendor and inter-domain inter-working
- Enhance service offerings with Ethernet over SONET/SDH or OTN
- Provide end-to-end service activation
- Integrate cross-domain provisioning of switched connection services
- Provide accurate inventory management
Optical Control Plane Value Chain

Optical Control plane (distributed intelligence)

Bandwidth request or release from clients

Network failure

Control Plane

Signaling Routing Discovery

Management System

Improved bandwidth usage/efficiency
Scheduled/unscheduled Bandwidth on Demand
OSS simplification
Auto-discovery
Challenges of Control Plane Management

- Ensure consistent management policy across multi-domain environment, e.g.,
  - Network wide consistency for CP configuration, such as addressing schema (e.g., TNA)
- Balance between delegation (to CP) and ultimate control (by MP) (i.e., centralized vs. distributed) e.g.,
  - Minimize duplication of data & process
  - Maintain consistency between MP and CP database
  - Restore consistency without affecting active services
- Smooth migration from MP-driven service management (Call/Connection mgmt) to hybrid or CP-driven Service Management
- Accurate and cost-effective fault analysis for TP failures using CP capabilities
Integrating Control Plane Networks

Operational Issues

- Integrate the control plane with operations
  - Bridge the current world to a control plane enabled network
  - "Operationalize" the new capabilities to ensure value of the new integrated network is realized

- Streamline processes and operations
  - Maintain flow through
  - Reduce provisioning processes
  - Improve accuracy of records (e.g., for operations, trouble shooting, capacity planning)
  - Maintain single, multi-vendor connection to control plane
  - Maintain single federated of view of control plane and non-control plane networks

- Enable fast turn-up of services and new technologies
  - Provide full functional OSS support for control plane network technology and related services
  - Align OSS support with network deployments

- Control Plane Management
  - Failures should not impact service
  - Administer addresses for signaling and routing
  - Assure security for control plane, network elements and OSS
Standards for Control Plane Management

- **ITU-T G.7718**
- **ITU-T G.7718.1**
- **TMF MTNM v3.5**
- **OIF-CDR-0.10**
- **GR-1110-CORE**

Diagram showing the interaction between Network Management System (NMS) and EMS (Equipment Management System) elements in the Control Plane Management context. Control Plane elements include Transport Plane and Network Element.
Testbeds - Europe

MUPBED: A Pan-European Multi-Domain and Multi-Layer ASON/GMPLS Test Network

Hans-Martin Foisel, Deutsche Telekom

OIF Workshop, Athens, May 8th, 2006

http://www.iast-mupbed.org/

E-NNI
- Most powerful inter-domain interface
- Supports seamless networking in heterogeneous multi-domain network environment, which will be present for long time (for ever?) in research and carrier's networks
- Is today a high priority (hot) topic in research networks and field tests / demonstrators worldwide

UNI 2.0 Ethernet
- Very powerful interface to client networks and applications (integrated in API implementations)
- Supports on-demand services
- Is today a high priority (hot) topic in research networks and field tests / demonstrators worldwide
OIF Interop Control Plane Demo

- Worldwide demo at ECOC 2007 September in Berlin
- The OIF Worldwide Interoperability Demo combined:
  - Ethernet Services
  - Control plane
  - Flexible Transport Bandwidth functions
  
  To provide on-demand Ethernet services over a bandwidth efficient transport network enabled by OIF UNI and E-NNI

Control plane – a set of functions that act on a bearer (data) plane for the purpose of automated call/connection setup and release.

Ethernet Services – Point-to-Point Private Line

Data over transport - GFP, VCAT, LCAS
The FIRE Future Internet Research and Experimentation Initiative

- Experimentally-driven long-term research, related to the Future Internet
  - Advanced networking approaches to architectures and protocols
  - starting from the running FET SAC projects, to include the new IPs which will be selected in call 2
  - Open to fresh bottom-up ideas, no backwards-compatibility constraints

- Setting up large-scale testing environments:
  - Creating a European Laboratory for testing potentially disruptive internet concepts
    - Possibly building on ONELAB and on the advanced testbeds parts of SAC projects
  - Federating existing and planned testbeds for emerging technologies
    - exploiting synergies between pre-commercial technologies and services testbeds, e.g. in line with the framework provided by PANLAB

Definition of a European identity based on EU needs and strengths
Possible synergies with FIND/GENI (US) and related initiatives worldwide
Verizon’s “Just in Time” Service

- Speedy bandwidth adjustments
- Split second traffic rerouting around problems
- Better network utilization
Summary

- Optical control plane should enable large scale service deployments
- Multi-faceted collaborations will move it from applied research to wide-scale deployment
- Steps along the way include
  - Goals, architecture and value chain
  - Identifying management, operational and integration challenges
  - Agreeing on standards
  - Learning from distributed test beds and demos
  - Tying in with research on future generation networks
  - Deploying services using the control plane paradigm